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INTEGRALLY MOLDED LATERAL COMPRESSION SEAL

FIELD OF THE INVENTION

[0001] The subject invention relates to a casing for a heating and ventilation and air-conditioning (HVAC) system in an automobile.

BACKGROUND OF THE INVENTION

[0002] The HVAC systems generally incorporate molded plastic casing sections that are joined together by various means. If the joint between the sections of the casing does not have an air tight seal then it is possible for air to leak from the casing, which results in a loss of comfort in the passenger compartment, a whistle type noise, or both. The noise can cause a reject by the vehicle assembly plants and increased warranty costs.

[0003] There are several methods to provide sealing at the joints of the casing. One method is to use a tongue and groove joint. To maintain moldability of the casing section and assemble-ability, the tolerances are such that only at maximum material condition does the tongue have line on line contact in the groove. At all other conditions, there is a gap between the tongue along the flat surfaces surrounding the tongue, i.e., the surface from which the tongue extends. The warping of the casing and possible spreading of the casing can open up this gap at the joint thereby allowing air to flow around the tongue and through the outer gap and creating a leak and/or whistle. Other methods relate to putting a sealing material, such as foam or sealant, between the two sections of the casing to seal any irregularities. These additional seals add cost and can be miss-assembled. It is desirable to provide positive sealing

without using separate or additional foam pieces that can increase production time and increase costs.

SUMMARY OF THE INVENTION AND ADVANTAGES

[0004] The invention improves the tongue and groove joint between two components of a heating and ventilation and air-conditioning system in an automobile. The joint includes a groove in a first component and a tongue extending from a second component to a distal end in the groove and the tongue has a slot extending into the distal end thereof for splitting the tongue into first and second forks in frictional engagement with said groove.

[0005] This invention uniquely addresses the issues inherent with the traditional solid tongue and groove design. The traditional solid tongue and groove requires excessive force to put it together if designed with interference fit. However, the split tongue will simply flex when inserted in the groove and thus create an air tight seal at reasonable assembly forces. The plastic tongue will be formed such that there is a "split" or very narrow slot in the middle of the tongue so that the forks of the tongue will flex inwards when inserted in a mating groove.

[0006] The forked tongue and groove joint allows designing an interference fit with current molding tolerances and capabilities, eliminates potential for air leakage resulting in whistles and performance degradation, improves seal integrity as pressure rises in the casing as high pressure air will tend to force the forked tongue to expand and increase the sealing effect, and eliminates the need for a foam case seal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0008] Figure 1 is a perspective view of a heating and air conditioning module in which the subject invention has utility;

[0009] Figure 2 is a cross sectional view of a first embodiment of the subject invention;

[0010] Figure 3 is a cross sectional plan view of a second embodiment of the subject invention; and

[0011] Figure 4 is a cross sectional plan view of a third embodiment of the subject invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] A casing for a heating and ventilation and air-conditioning (HVAC) system in an automobile is generally shown at **10** in Figure 1. As is well known, the system includes a blower **12** in the casing **10** for moving air through the casing **10** and a heat exchanger **14** in the casing **10** for exchanging heat with the fluid flowing through the casing **10**. The casing **10** comprises a plurality of sections or components **16-24**, each of which is molded of plastic material. The sections **16-24** of the casing **10** are connected and sealed to one another at a plurality of joints, each of which is generally indicated at **26**. As will be appreciated, the joint **26** can be used in various environments other than a HVAC system to connect and seal the periphery of two plastic components or sections thereof together. For example, the joints **26** could

connect and seal the various modules of the HVAC system as well as other components.

[0013] As illustrated in Figures 2, 3 and 4 each of the joints **26** seals the sections **16-24** together to prevent leakage of air flow through the casing **10** and includes a groove **28** in the first section and a tongue, generally indicated at **30**, extending from the second section to a distal end **32** in the groove **28**.

[0014] The improvement resides in the tongue **30** having a slot **34** extending into the distal end **32** thereof for splitting the tongue **30** into first and second forks **36** in frictional engagement with the side-walls of the groove **28**. The forks **36** are compressed together by the groove **28** to narrow the slot **34** from top to bottom to retain the tongue **30** in the groove **28**. As will be appreciated, the tongue **30** and groove **28** extend along the joint **26** between the sheet-like walls of the sections of the casing **10**.

[0015] Each tongue **30** extends from a latterly extending flange surface **38** to present a shoulder on either side of the tongue **30** and a sealing surface **40** is disposed on either side of the groove **28** for engaging the shoulders of the surface **38** in the embodiments of Figures 2 and 3. The groove **28** has a bottom and the distal end **32** of the tongue **30** is spaced from the bottom when the surface **38** defining the shoulders engages the sealing surface **40** on either side of the groove **28**. In other words, the groove **28** is deeper than the tongue **30** to prevent the tongue **30** from bottoming out in the groove **28**.

[0016] However, in the embodiment of Figure 4, the flange surface **38** remains spaced from the sealing surface **40** when the tongue **30** is fully inserted into the groove **28**.

[0017] The distal ends **32** of the forks **36** of the tongue **30** are tapered inwardly sixty degrees (60°) to facilitate insertion of the tongue into the groove **28**. Additionally, the sides of the tongue **30** are tapered five degrees (5°) in draft. Furthermore, the sides of the tongue **30** are normally 0.2 mm (0.008 inch) wider than the width of the groove **28**, i.e., distance between side-walls, to define an interference fit.

[0018] As shown in Figure 3, a sealing bead **42** may be optionally included to extend along the sides of the tongue **30** for sealing engagement with the side-walls of the groove **28**.

[0019] As another option, a snap together connection **44** in Figure 2 may be disposed adjacent the tongue **30** and groove **28** for holding the sections together. The connection **44** includes a male tang **46** having an opening therein for receiving and snapping over a ramp **48**. The ramp **48** is disposed in the opening in the tang **46** to hold the sections together.

[0020] As illustrated in Figure 4, the groove **28** may include a lead-in portion **50** having a greater width than the bottom portion of the groove **28**. The lead-in portion **50** is connected to the bottom narrow portion of the groove **28** by tapered shoulders **52** that facilitate the entry of the tongue **30** into the groove **28**. The tapered shoulders **52** are also disposed at sixty degrees (60°).

[0021] Although described in connection with a HVAC system, the subject invention has utility in sealing components of cases in general, particularly plastic cases.

[0022] Obviously, many modifications and variations of the present invention are possible in light of the above teachings. The invention may be practiced otherwise than as specifically described within the scope of the appended claims.